POTATO GROWING

in the Atlantic Provinces

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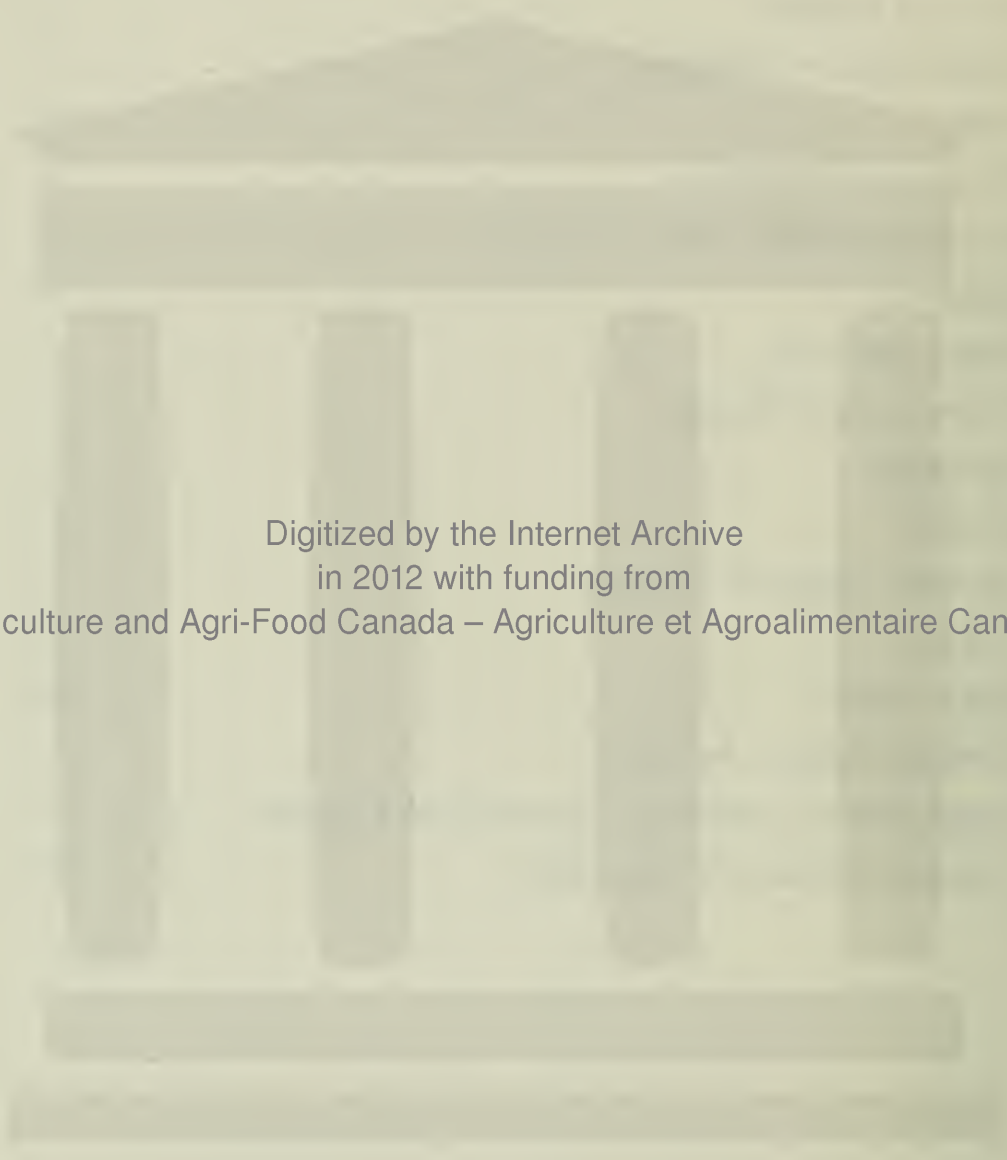
Cover photo: A field of well-cultivated Green Mountain potatoes.



POTATO GROWING IN THE ATLANTIC PROVINCES

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Potatoes are the main cash crop in Prince Edward Island and New Brunswick. Seed potato production is the most important aspect of this enterprise, but growing potatoes for processing is gaining in importance.

The growing of potatoes for table stock is likewise very important in New Brunswick and Prince Edward Island. Large quantities are exported to Ontario and Quebec, where they must compete with the local product in quality and price.

Today, growing potatoes is a highly specialized business requiring large capital investments. If the enterprise is to be profitable, farm operators need both technical training and business experience. They must be prepared to keep up with rapid development in the industry, such as changes in varieties grown, shifts to fewer and larger farms, marked changes in mechanization and crop use, improved cultural practices, and updated recommendations for using fertilizers and pesticides.

Profitable potato production depends on several factors, including size of operation and price received by growers. Growers who obtain high yields generally have lower production costs per bushel. However, among growers in any given production area with the same yields per acre, there is considerable range in operation costs per unit. The amount of fertilizer used, the market price of the seed planted, the efficient use of labor, and several other factors affect the cost per unit. Generally, the larger the acreage of crops per farm, the higher the profits per acre. The financial advantage of large-scale operations is usually related to greater efficiency in the use of labor, machinery, fertilizers, chemicals, and land. Large enterprises are also more conducive to savings in buying and selling practices.

SOIL AND CLIMATE

The yield of tubers and their shape and general attractiveness depend largely on the texture and physical composition of the soil. The ideal potato soil is rich, deep, friable, well-drained medium or sandy loam, free from stones, moderately acid, and contains adequate organic matter. The potato crop requires abundant moisture, but does not thrive in cold, waterlogged soil.

In Prince Edward Island, the soils have few stones and are slightly red and friable. The tubers are usually fairly smooth and the red soil lends a distinctive tinge to them, making it quite easy for an observant person to know where they were grown. The soils in the Upper Saint John River Valley are slightly stony and sometimes this affects the smoothness of the potatoes and adds to the problems of cultivation and harvesting.

[1] Retired 1966.

The potato has made its greatest development in areas where the average daylight temperature seldom exceeds 70° F and where the nights are cool. Tubers form best when the air temperature is about 60 to 65° F. This is close to those in Prince Edward Island and New Brunswick. For example, at Charlottetown, the long-term mean temperatures for June, July, and August are 58, 66 and 65° F respectively. The mean temperatures in the Upper Saint John River Valley are two or three degrees higher.

The amount of rainfall and its distribution during the growing season markedly affect yields. In the best potato-growing areas in humid regions, total rainfall between planting and harvesting ranges between 12 and 18 inches. For best results, it should be evenly distributed, with about an inch per week throughout the growing season. Although seasonal precipitation for the Charlottetown area varies considerably, the long-term averages for June, July, August, and September are 2.90, 3.02, 3.37, and 3.83 inches respectively.

MAINTAINING SOIL FERTILITY

Crop Rotation

On sandy soils, yields of tubers are usually higher when crops are rotated than when potatoes are grown on the same land year after year. Sod crops in the rotation are beneficial partly because they add organic residues to the soil. Also, rotating the crops discourages the development of harmful insects and lessens losses from diseases that often become troublesome where potatoes are grown for several years in succession.

Although many large growers may obtain satisfactory yields by growing potatoes on the same land year after year, there is danger of soil erosion on sloping land, of loss of organic matter, and eventually of deterioration of the soil.

Green Manure Crops

Where potatoes are grown in conjunction with livestock farming, it is easy to keep the soil fertile. Barnyard manure is readily available and the hay and pasture crops in the rotation help to conserve the soil organic matter. It is then seldom necessary to use a season's crop as green manure.

The more extensively potatoes are grown, the greater is the need for green manuring. When potatoes are the main crop, green manure crops are necessary to maintain the humus content and the water-holding capacity of the soil. They improve the physical condition, and also temporarily increase the acidity of the soil, which is important in the control of scab. Clover is one of the most useful soil-improvement crops. Since it is a legume, it gathers nitrogen during its growth, and this nitrogen is added to the land in which the crop grows. In addition, the aftermath, when plowed down, adds humus to the land.

Sometimes non legume crops, such as fall rye, may be grown as green manure. But these crops may need nitrogen fertilizer to promote growth and subsequent decomposition. After an early potato crop, fall rye helps to control soil erosion. particularly on sloping land. Seed it in early September and turn it under in the spring when it is 10 to 12 inches high.

Barnyard Manure and Commercial Fertilizer

Barnyard manure that has been properly piled and decomposed is an

excellent fertilizer. Apply it (10 to 12 tons per acre) as a topdressing to the sod land before plowing, or to the meadow land the previous year. It stimulates the hay crop and becomes thoroughly broken down and incorporated with the soil, making the nutrients readily available to the next potato crop and lessening the danger of potato scab. Do not apply fresh farmyard manure to potato land just before planting time. It is high in ammonia, and promotes the activity of the scab organism.

Large quantities of commercial fertilizers are used in growing potatoes and the returns usually justify the expenditures. The kind and amount of fertilizer needed depend mainly on the type of soil and its fertility, on the available manure and its condition, on the rotation practiced, on the potato variety, and on seed spacing.

Under most conditions a complete fertilizer, containing nitrogen, phosphorus, and potassium, is required for best results. No one ratio suits all potato soils but a 1:2:2 is the most widely used in Prince Edward Island, and a 1:2:1 is generally used in the other provinces. It is important for you to have your soil analyzed at a provincial soil laboratory and to follow the recommendations made. This is particularly desirable if you grow potatoes continuously, as fertilizer residues may alter the requirements of the succeeding crops. Results of field tests are reviewed annually by federal and provincial officers and recommendations arrived at. These are published by the Maritime Fertilizer Council, and may be obtained from the provincial departments of agriculture and federal research establishments.

[2] Information supplied by D. C. MacKay, Research Station, Charlottetown, P.E.I.

Applying the Fertilizer

The most effective method of applying the fertilizer is with a potato planter equipped to place it in the soil in bands about two inches on each side of the seed pieces and slightly below them. Do not let commercial fertilizer come in contact with the seed pieces in the soil because it may cause injury during germination and hence reduce the stand.

In tests at the Research Station at Kentville, the fertilizer applied in this way increased the yield of potatoes by 61 bushels per acre over that from a broadcast application.

If you must broadcast the fertilizer, apply it on the cultivated land immediately before planting and thoroughly work it in.

Liming [2]

Potatoes tolerate soil acidity better than many crops, but practically all of our soils need some lime even for this crop. Do not apply it in the potato year, but in the rotation as far away from this crop as possible. Soil tests are essential for determining the proper amount. The best yields are obtained at pH levels between 5.0 and 5.4. Liming above pH 5.4 increases the presence of scab. Finely ground dolomitic limestone should be used since it acts quickly and prevents magnesium deficiency. Do not plant in soils that received heavy applications of mussel mud in previous years.

Preparing the Soil

Plow the soil in the fall to let the sod decompose and release plant food for the next crop year. Work the soil to a depth of 6 to 7 inches. Light soils that are easily handled, or hilly land

subject to soil erosion, may be plowed in the spring. Thorough cultivation in the fall and spring gets rid of many troublesome weeds, ensures a good seedbed, and benefits the moisture, aeration, temperature, and available plant food of the soil. In turn, the shape, quality, and yield of tubers are improved.

SEED

It is very important to use good potato seed stock. Choose seed of an adaptable variety that is true to name. Be sure that it is sound, not oversize, and free from frost injury and disease.

For best results, use Foundation seed. It is a high-quality seed that is relatively free from virus diseases. The extra cost is small and is greatly exceeded by the returns from the increased yields.

Most of the seed planted in the Atlantic Provinces is 'A' size (3 to 12 ounces), which is cut into several pieces. This may be an economical way to use seed, but is probably largely responsible for the spread of ring rot. The use of whole 'B' size seed (1½ to 3 ounces) avoids cutting, but this seed must have a Foundation or Certified rating. It is small either because of close planting to give this size of seed or because it is the grade-out from table stock sizes. Small seed from uncertified stock is often small because the parent plants were diseased and stunted.

If you use cut seed, see that each piece is blocky in shape, contains at least two eyes, and weighs 1½ to 2 ounces. Seed may be cut immediately before planting or cut and stored. If it is to be held over for a number of days, spread it out in a clean cool place to a depth of not greater than one foot and fork it over once each day. If it is stored in bags, put no more than one bushel in each bag. Leave the bags open and do not pile one on top of another. Move them often.

Storage humidities and temperatures affect seed quality. Low humidities cause shrinkage and high temperatures encourage sprouting too early in the season. These sprouts should be removed. Although potatoes that have been sprouted once usually make satisfactory seed, it is better to prevent sprouting by storing them at 38 to 40° F. But remove the potatoes from the low-temperature storage 3 weeks before planting. This allows the potatoes to warm up and the eyes to germinate. During this period, turn the tubers at least three times to ensure even germination and the development of strong, thick, short sprouts. In cutting sets, it is hard to tell whether eyes will germinate or not unless growth has started. This is particularly true with the varieties Sebago and Katahdin, in which the eyes in the stem end are weak or slow to germinate. Seed that has been greened germinates and emerges in the field much more rapidly and evenly than seed not previously warmed up or allowed to sprout.

If the seed is to be treated to control seed-borne diseases such as blackleg, rhizoctonia, verticillium wilt, and fusarium storage rot, do it as soon as the potatoes are taken from storage, that is, before they sprout and are cut. The chemicals can injure the sprouts and the cut surface. Do not store or transport treated potatoes in old untreated sacks as the seed pieces may become reinfected. Follow directions for seed treatment carefully. More information on control of seed-borne diseases may be found in Publication 1215, *Control of Diseases and Pests of Potatoes.*

PLANTING AND CULTIVATION

Begin planting as soon as the soil is ready, usually May 15 to 20, depending on the season. Be sure that the planter you use is in good mechanical condition, adjusted to drop the sets to the proper depth and to cover them evenly with not more than three inches of soil. Shallow covering is very important as it allows the sprouts to emerge much earlier than if the sets were covered to a depth of six to seven inches. You may then place a good covering at the first cultivation and hill to smother small weeds.

The main reasons for cultivating the potato crop are to control weeds, to aerate the soil, and to loosen the surface soil so that it will absorb and retain moisture. Further cultivation only damages the roots, adds needless expense, and often lowers the yields.

The most important part of cultivation takes place before the crop is planted. If you follow good cultural practices, weeds are not often a serious problem. Early-fall plowing, followed by frequent cultivation with a spring-tooth harrow, will bring the rootstocks of perennial weeds such as quackgrass, perennial sowthistle, and sedges to the surface where the sun, drying winds, and frost will destroy them.

Early-spring cultivation, before planting and when the crop is emerging, controls most early-season weeds. In most cases, cultivation should be completed by blooming time. By then you should have built up a good broad hill, extending to the center of the drill on either side. But in the hilling operation, be sure to run the cultivator as shallow and as far from the plants as possible to avoid cutting the roots. Do not disturb the hill further unless it is absolutely necessary in order to control weeds. The shade provided by the vines later in the season helps to control weeds.

If herbicides are used, more than three cultivations or no cultivation after planting may reduce the yield of tubers.

Weeds such as lambsquarters, ladysthumb, wild mustard, sowthistles, pigweeds, grasses, and thistles that emerge after the last cultivation are a serious problem in some areas. They not only compete with the potato crop for nutrients, moisture, and light but also cause severe losses to the producer by lowering the grade and quality of the crop. It may be necessary to use herbicides to control them.

CONTROLLING WEEDS WITH CHEMICALS

The herbicide to use depends on the time of application and the weeds to be controlled. Applying herbicides to the soil before planting or during early growth controls some troublesome weeds in the spring, and spraying after the last hilling controls many late-season weeds. The following recommendations may help you to choose the proper treatment.

- Use a *preplanting* herbicide to control quackgrass.

Dalapon — Apply it at 10 pounds per acre in enough water to thoroughly wet the grass. Treat the grass when it is growing actively; the treatment is more effective in the spring than in the fall. Be sure to cultivate within 14 days. There is very little hazard to white-skinned varieties of potatoes; they can be safely planted 4 days after applying dalapon. Do not use this chemical if you are going to plant red-skinned varieties.

- Use a *preemergence* herbicide to control germinating annual broad-leaved weeds and grasses.

Dinoseb — Apply the amine salt at 3 to 5 pounds in 35 to 40 gallons of water per acre 2 to 3 days before the crop emerges (when 5 percent of the potato sprouts show), for annual broad-leaved weeds. If annual grasses are a problem, add 4 pounds of dalapon to the dinoseb.

Linuron — Apply 1 to 2 pounds (active) per acre in 25-80 gallons of water. Do not use on sandy or coarse-textured soils that are low in organic matter, as severe crop injury may result.

Prometryne — Apply 1 to 3 pounds to the weeds after they emerge and either before the crop emerges or after the first hilling.

2,4-D or MCPA — To control wild radish and wild mustard when other weeds are not a serious problem, apply one of these chemicals at 4 to 6 ounces of the active ingredient per acre to seedling weeds before the potatoes emerge. This treatment does not control grasses and may deform potato foliage slightly, but will not decrease yield.

- Use a *postemergence* herbicide to control seedling broad-leaved weeds.

Propanil — Apply it at $\frac{3}{4}$ pound of the active ingredient per acre in at least 50 gallons of water with a high-pressure or air-blast sprayer on weeds that are not more than 4 inches high. Do not apply it in combination sprays with any insecticide.

The science of chemical weed control is progressing rapidly and new chemicals are frequently being offered to research people for investigation. Because of this you should keep in touch with your local agricultural representative, or specialists at the research stations.

IRRIGATING

More and more farmers who grow potatoes on a large scale are irrigating their crops by using sprinkler systems, particularly on light sandy loams. Relatively high temperatures, persistently strong winds, and poor distribution of rainfall combine to create the need, whereas the high acre value of the early potato crop provides the economic incentive.

To produce a maximum yield of high-quality tubers, the potato crop must grow actively throughout the season. A temporary shortage of moisture, which checks growth, reduces both yield and quality. This is particularly true of the variety Netted Gem, where lack of uniformity in growth often leads to knobby, malformed tubers of little market value. During long dry spells, irrigation often means the difference between crop success and failure.

The problems of when to apply the irrigation water and the quantity needed are very important, particularly with the early potato crop. The need to irrigate is largely determined by the nature of the soil, its moisture-holding capacity, daily precipitation, and prevailing temperatures and wind velocities.

Studies conducted in southwestern Ontario by the Department indicated that any drought lasting more than 7 days slows tuber growth. At Harrow, Ontario, the early potato crop uses an average of 0.15 inch of water per day from late May until harvest in late June or early July. The average

interval between irrigations for optimum early potato production on well-drained sandy loams has been 7 days. Based on these two facts, a simple schedule of 1 inch of water every 7 days has been developed. Any rainfall occurring during the 7-day period reduces the amount of irrigation water needed. The use of these averages will, of course, result in supplying more water than needed during cool weather, and slightly less during hot weather. On the darker colored sandy loams and loams where moisture reserves are greater, the irrigation schedule might be 1½ inches every 10 days.

Instruments have been designed to measure the amount of soil moisture available to the growing plant, but good sound judgment enables you to determine best when irrigation is most beneficial.

KILLING THE TOPS

The removal of the tops is a necessary preparation for harvesting. Occasionally, an early frost may kill the plants, but usually you must kill them yourself by using one of the methods that have been developed. Killing the tops is necessary for the following reasons.

- It reduces the time and work involved in harvesting by removing the mass of living tops that would interfere with the normal operation of digging equipment.

- It prevents the introduction of virus diseases into growers' seed plots. Some growers seek to maintain quality market seed by growing their own seed requirements in special plots that are planted away from their commercial fields and that are carefully rogued through the season. By planting these plots as early as possible, enough sizable tubers may be produced before aphids, the chief insects responsible for the spread of virus diseases, become plentiful. The tops may then be killed, thus protecting the tubers from becoming infected.

- It stops growth when the tubers are the desired size. Killing the tops at the proper time prevents losses from oversized tubers.

- It eliminates dependence on natural death of the plants, or their destruction by frost, thus enabling you to begin harvesting on a date of your own choosing.

- It reduces or eliminates losses through rot in storage. Digging the crop in a field that has shown signs of late blight disease can be exceedingly dangerous when any green leaves or stems persist. Spores of the disease are likely to be present on the plants and on the surface of the soil. Then when the crop is being harvested, many tubers pick up spores and carry them on their skins into the storage quarters. Soon these spores germinate and the tubers start to decay. To control losses caused by late blight rot, kill the plants and delay digging for at least ten days after all leaves and stems have died. During this period, the spores also die.

Machines that cut off the plants near ground level and shred them may be used to prepare a field for harvesting. For the small grower, having his field treated by a custom operator is probably the most economical procedure, as the cost of owning a machine that may be required for only one day in the year is rather great.

These machines, commonly called top beaters, do a good job if they are set to operate at drill level. But in this position some tubers that are near the surface may be injured, especially

if the wheel tracks are rough and uneven. In addition, knocking soil from the crests of the drills increases the danger of greening and of low-temperature injury. When the beater is set to operate above drill level, a few inches of the stalks are left. Under open autumn weather, new growth may develop, particularly with late-maturing varieties. The stalks may also carry the late blight fungus, which may infect the tubers at digging time. If this danger exists, spray the field with copper sulfate (bluestone) dissolved in water, applying about 15 pounds of the chemical per acre a few hours before digging the tubers.

The most popular way to remove the tops is to spray them with a solution containing a chemical recommended for this purpose. Copper sulfate, mentioned above, may be used, but at least 30 pounds per acre are needed to give even a slow kill. Its action may be improved slightly by adding about 15 pounds of common salt. At the usual price of the sulfate, the spray is rather expensive.

The chemical generally used is sodium arsenite. This is sold as a liquid concentrate under several trade names and is applied at 1 gallon per acre. It is relatively cheap and is effective, but its extreme toxicity to animals makes it a dangerous chemical to use, especially if you practice mixed farming. When you use it, keep any cattle from entering the treated field, do not allow spray to drift to a pasture field, be careful not to spill the solution in yards and lanes or to let it get into streams or other waters, and dispose of the empty containers safely, preferably by burying them.

Several other chemicals are on the market, including such products as Sinox, Dowspray, and Reglone. These give good results when applied according to directions. Research in this field is continuing and other products may, from time to time, appear on the market. You should therefore consult your local extension or research services to find out which top killers are recommended for your area.

HARVESTING AND STORING

Harvesting potatoes carefully at the proper time very often means the difference between profit and loss. The bulk of the crop should be harvested before October 20, as this is the average date for the first killing frost that damages the tubers in the ground.

As potatoes bruise easily, be very careful at all stages of handling, such as digging, picking, trucking, and storing.

Almost any type of digger does a good job if it is in good mechanical condition, properly adjusted, and operated at a moderate speed. After a small part of the crop has been dug, examine the potatoes closely for any evidence of bruises and cracks and adjust the digger and handling of the crop accordingly. Bruises are not always noticeable at harvest, but may show up after storage and result in heavy losses by lowering the grade and increasing the number of culls.

Store potatoes for seed in clean, well-ventilated storages, away from direct light (either daylight or artificial) in order to prevent greening. The tubers should be dry and reasonably free from soil. Excess soil in the bin hinders air circulation so that temperatures in some places in the storage may be high enough to cause sprouting and excessive decay, while in other places freezing damage may occur.

A bulk potato harvester.

Regulate the ventilation to hold the potatoes at about 50 to 60° F with high relative humidity during the first 10 to 14 days. Under these conditions, cuts and bruises heal rapidly and losses from shrinkage and decay are reduced. A low temperature at the beginning of the storage period is not necessary to prevent sprouting because the potatoes are then dormant and unable to sprout.

After the preliminary curing period, temperatures may be lowered. It is best to store seed potatoes at 38 to 40° F since they do not sprout at this temperature. Keep the relative humidity at 75 to 90 percent.

If late blight was present in the field, lower the temperature in the storage to 40° F as soon as possible to retard decay. Keep the humidity lower to dry the surface of the potatoes and reduce the spread of diseases. The tops of the bins should be leveled off to allow room for cooling and evaporation of moisture.

PACKAGING

Grade your potatoes carefully from good-quality clean stock. Never grade inferior stock for a class higher than its condition warrants. Pack the potatoes in attractive new containers, tagged with variety, class, or grade plainly marked. Bags should be properly sewed, and crates nailed and bound. The finished package should be clean and attractive and have eye appeal.

Handle Certified and Foundation seed potatoes in the same manner. But be sure that the contents of the package is the stock indicated by the certification number on the certification tag attached to the container.

VARIETIES [3]

A rather large number of varieties of potatoes are grown in the Atlantic Provinces. They differ in time of maturity, yield, appearance, cooking and marketing qualities, and resistance to various diseases and insects. Brief descriptions of the most commonly grown varieties are given below.

Avon is as resistant to late blight as Keswick and also is moderately resistant to common scab. It matures at the same time as Katahdin and is slightly superior in yielding ability. The crop is exceptionally uniform in both size and type. The tubers may be hollow-hearted under certain growing conditions. Avon makes an especially good chip when processed immediately after harvest; it makes a better chip than Irish Cobbler and Cherokee. Because the cooking quality for both boiling and baking is excellent, the variety is also worthy of trial as a table potato.

Avon was developed by the Research Station, Fredericton, and released in Nova Scotia in the spring of 1958.

Cherokee is early to midseason in maturity. The plants are compact and low, the foliage is fine and of a flat green color, and the bloom is white. This variety is susceptible to verticillium wilt, mild mosaic, and late blight. It sets more tubers than most varieties. The tubers are blocky and white and are quite resistant to common scab. The cooking quality is only fair, but the tubers are satisfactory for making chips. Be careful in handling this variety as it bruises quite easily.

Cherokee was developed by the United States Department of Agriculture.

Fundy is a very promising variety. It is early to midseason in maturity. The tubers, in contrast with most early varieties, are smooth and attractive, and are excellent for cooking. The eyes are shallow. The yield is slightly higher than Katahdin. The variety is as resistant to late blight as Keswick. The foliage is rather unattractive, and the leaves tend to roll at the rims as the plants mature.

Fundy was developed by the Research Station, Fredericton, and distributed to growers in the Maritime Provinces in the fall of 1958.

Grand Falls is a midseason to late variety that gives a high yield of high specific gravity potatoes, good for cooking and chipping.

It was developed by the Research Station, Fredericton, and introduced in 1965 as an early harvest industrial variety for the manufacture of potato starch.

Green Mountain is a main-crop variety requiring about 140 days to mature. The plants are large and spreading, with light-green foliage and white blooms. Both plants and tubers are highly susceptible to late blight. The tubers are susceptible to common scab and net necrosis. The variety produces excellent yields of tubers that have white flesh and lightly netted skins. The tubers are inclined to be long, somewhat flat, blunt at the ends, and moderately deep eyed. Well-matured tubers are excellent for cooking, but are not suitable for chipping.

Hunter is a white, midseason to late variety. It is resistant to skinning and bruising, field immune to viruses X

[3] Information supplied by G. C. Ramsay and J. I. G. Ross, Production and Marketing Branch, Charlottetown, P.E.I.; and H. T. Davies, Research Station, Fredericton, N.B.

Potato varieties: Keswick, Kennebec, Netted Gem, Sable and Sebago.

and A, and resistant to blackleg, verticillium wilt, and the eastern form of fusarium rot. It produces a high yield of uniform, attractive tubers of moderately high dry matter content that are excellent for cooking. The seed should be cut and the sets suberized before planting. If they can be green sprouted, so much the better. In planting, be sure to cover the sets shallowly.

Hunter was developed by the Research Station, Fredericton, and introduced in 1961.

Huron is a very high yielding variety resistant to common scab. It is a very late variety, maturing about the same time as Sebago. But the skin of the tubers matures early and the tubers are not readily bruised. The cooking quality is moderately good.

Huron was developed by the Research Station, Fredericton, and released in 1957, primarily for growing in Ontario.

Irish Cobbler is a widely adapted early-maturing variety. The plants are vigorous and upright and have a distinctive dark-green foliage and mauve blossoms in compact balls. Both plants and tubers are susceptible to late blight and verticillium wilt and the tubers to common scab and rhizoctonia. The tubers are medium to large, and are round with blunted ends; the eyes are well placed but are usually quite deep. The flesh is creamy white. This variety is excellent for cooking and is suitable for making chips.

Katahdin is a main-crop variety that matures in about 130 days. It yields well under favorable growing conditions. The plants are inclined to be low growing and spreading, and the leaves often roll during the latter part of the growing season. The variety is somewhat resistant to mosaic, leaf roll, and verticillium wilt, but is susceptible to late blight. The tubers are attractive, creamy white, round, and smooth, and have shallow eyes. They are easily graded because there are comparatively few culls. The cooking quality is only medium.

Katahdin was developed by the United States Department of Agriculture.

Kennebec is a main-crop variety that matures in about 130 days. The plants have light-green foliage and are vigorous growing and high yielding. They are resistant to several strains of late blight but are very susceptible to verticillium wilt and spindle tuber. The tubers are quite susceptible to common scab and late blight rot, and green very easily when exposed to light. They are inclined to grow oversize. They cook well and make excellent chips.

Kennebec was developed by the United States Department of Agriculture.

Keswick is a midseason to late, high-yielding variety. The excellent cooking quality and the fact that it is 2 to 3 weeks earlier in maturity than Katahdin make it a very promising variety for the table potato market. It is used extensively in early fall for both chipping and French frying. Keswick has a tendency to grow oversize and the large tubers are rough in type. But by spacing the plants 6 to 8 inches apart, and reducing fertilizer application, it is possible to produce a crop with an attractive run of tubers. Also, it is susceptible to bruising and must be handled carefully at all times.

Keswick was developed by the Research Station, Fredericton.

Netted Gem, also known as Russet Burbank and Idaho Baker, is late in maturing. It produces long russeted tubers with a high dry matter content. When grown under favorable conditions, it gives good yields, but is susceptible to second growth and knobbiness. The best crops are produced under irrigation. It is popular in the processing trade and as a baker.

Red Pontiac is a midseason to late, high-yielding variety. It is a vigorous-growing plant, but quite susceptible to late blight. The foliage is dark green and the bloom is dark mauve. The attractive tubers are round, deep red, and have shallow eyes. They are susceptible to late blight tuber rot and common scab. They also bruise quite easily and must be handled carefully.

This variety was developed by the United States Department of Agriculture.

Sable is an early-sizing variety of midseason maturity, equal to Warba in yield of marketable tubers at 80 to 90 days after planting. It produces white, smooth, attractive tubers that have shallow eyes and are moderately resistant to common scab. Sable is not recommended as a main-crop variety as it is low in dry matter.

Sable was introduced in 1964 by the Research Station, Fredericton.

Sebago is a main-crop variety that matures in about 140 days. It is high yielding, is upright in growth, and has dark-green foliage. The plants are somewhat resistant to late blight, but are susceptible to blackleg, verticillium wilt, and spindle tuber. The tubers are creamy white, smooth with shallow eyes, and round oval in shape. They have considerable resistance to common scab and late blight tuber rot, but are very susceptible to fusarium storage rot. The tubers, depending on their stage of maturity, are of fair to good cooking quality. They are also suitable for making chips and French fries.

Sebago was developed by the United States Department of Agriculture.

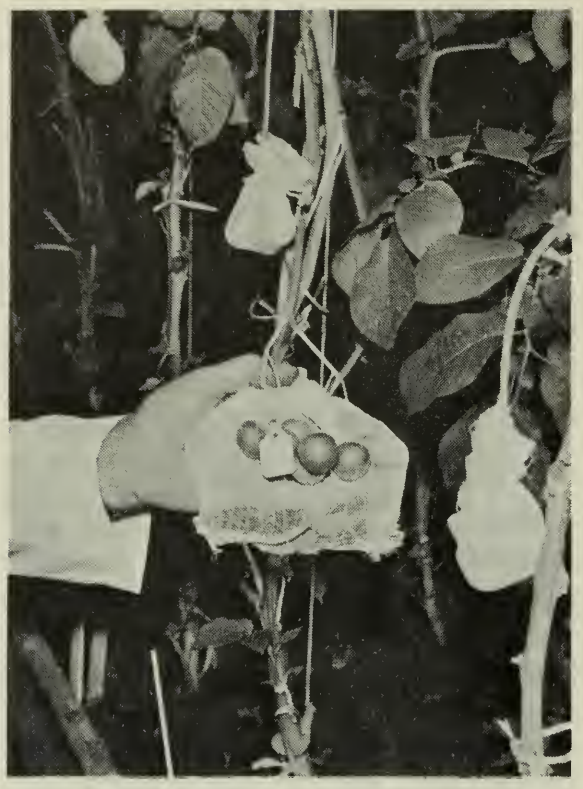
BREEDING IMPROVED VARIETIES[4]

Hundreds of potato varieties are available in the world today, but the perfect variety is yet to be found. All varieties have their weaknesses. In fact, if you examine any variety carefully, the weaknesses may appear to outnumber the strengths, or the good points. Also, diseases continue to take their toll, and to assume increasing importance in various areas from time to time. New uses for the potato are being discovered for which the old varieties are not satisfactory. Consequently, there is a continuing demand for new, improved varieties in every area where the potato is grown.

Potato breeding in Canada is conducted by both federal and provincial agencies. The main effort is the responsibility of the Research Branch of the Department. This national program is centered at the Research Station at Fredericton. The objectives are to produce varieties of potatoes adaptable to one or more regions across Canada, resistant to one or more serious diseases, and with qualities acceptable to the table, processing, and export markets; and to conduct research related to potato breeding in the fields of plant pathology, plant physiology, cytology, and genetics.

The development of a new variety of potato is a long-term, laborious,

[4] Information supplied by L. C. Young, Research Station, Fredericton, N.B.



Potato seed balls resulting from controlled crossing.

Potatoes bred for resistance to common scab. Note the difference in the amount of scab on the different tubers.

and expensive undertaking. In its simplest form, the process consists of crossing two carefully chosen parents, growing the progeny from true seed, subjecting this progeny to various selection pressures, eliminating the undesirable types, and multiplying for introduction to the trade an occasional outstanding individual. In actual practice, this process requires at least eight years, and about 100,000 seedlings are evaluated for each variety eventually released. About 30,000 seedlings are evaluated at Fredericton each year.

DISEASES [5]

The diseases of potatoes that cause the most serious market losses are common scab and late blight. Although other diseases cause less tuber loss through reduction in salable product, the demands of the export and local seed markets require that all diseases be held in check. Diseases and pests, such as potato wart and the golden nematode, assume great importance when considered from the standpoint of introduction to noninfested areas. A strict quarantine must be maintained on these maladies now localized in certain geographic areas of Canada. Control of some diseases is neither difficult nor costly, but for others no satisfactory control measures are known. Continued research is in progress to develop varieties of potatoes resistant to one or more diseases, and certain commercial varieties now in production have high resistance to specific diseases as a result of an intensive breeding program. Brief descriptions of the more serious diseases and their control follow.

Late Blight

No commercial varieties of potatoes are immune to late blight and the

[5] Information supplied by G. W. Ayers, Research Station, Charlottetown, P.E.I.

foliage of all varieties may be destroyed to a greater or less extent by the blight organism. The leaves of Sebago are slightly resistant and the tubers rarely become seriously affected. Other varieties, such as Keswick and Kennebec, are resistant to certain forms of late blight and highly susceptible to others.

To prevent serious losses from late blight attack be sure to spray your fields at regular intervals during the growing season with chemicals recommended for this purpose. Spray materials now available are highly efficient in preventing foliar infection. Supplement the spraying by heavy hilling to provide tubers with the added protection of deep soil coverage. Kill the tops about two weeks before harvest by spraying the foliage with a recommended chemical. This eliminates the fungus and there is then little danger of tubers contracting infection during harvesting.

Common Scab

The organism causing common scab is present in potato-growing areas across Canada. When susceptible varieties such as Irish Cobbler, Green Mountain, Kennebec, and Katahdin are planted in high lime soils, the crop may contract severe infection and be unsalable either on the seed or table stock market. Under similar conditions, Sebago shows moderate resistance, Avon and Cherokee medium resistance, and Huron high resistance. No satisfactory chemical control is known; the usual control practice is to use no lime or minimum amounts, depending on the degree of acidity or alkalinity as determined by chemical soil tests.

Ring Rot

All commonly grown potato varieties are susceptible to ring rot and there is no immediate promise of an immune variety appearing on the market.

Because ring rot is a highly contagious disease, it is difficult to control. The potato industry is supported by legislation that, when properly implemented, holds individual grower losses to a minimum. When established sanitary practices are disregarded, however, a high percentage of tubers may rot in the field or in storage.

As no ring rot is permitted in potatoes sold for seed, you must be extremely careful to procure disease-free seed and to use equiment that is not contaminated. The increased practice of custom planting and set cutting has favored the spread of ring rot from farm to farm. If the disease is to be held in check, the machines for these jobs and any other mobile equipment must be thoroughly sterilized after each grower's potatoes are planted.

When ring rot is found, you must dispose of graded stock on the table market. Get rid of all potatoes on your premises, and sterilize all storage areas and equipment used in handling the crop. Purchase new seed from an area not suspected of harboring the disease organism.

Verticillium Wilt

Potato fields are often rejected by Seed Inspection Services because of the presence of verticillium wilt. This disease usually becomes evident in midsummer; yields of affected hills are reduced, and tubers show slight to moderate stem-end discoloration.

The disease is carried on the surface of the seed or in the tuber tissue. Soil contaminated from a previously affected crop may also be a source of infection.

After an infected crop is grown, the strain of the organism found in the Atlantic Provinces does not persist in the soil for more than three years. Much of the infection found can be traced to the planting of potatoes successively or every second year on the same land. When the soil is heavily contaminated, most potato varieties show high susceptibility to wilt.

Treating the seed with an organic mercury compound is highly effective in controlling wilt when seed is planted in noncontaminated soil. For seed-borne infection, spores present on the seed surfaces are the main source of infection; internally borne fungus elements play a small part in spreading the disease.

Under a rotation of three or more years, and when seed treatment is not practiced, the varieties Irish Cobbler and Kennebec are quite susceptible. Under similar conditions, the disease is not usually serious in Sebago, Keswick, Katahdin, Green Mountain, and Hunter.

Blackleg

Blackleg is a bacterial disease that causes the stem tissue and tubers to rot, the infection starting on or in the seed pieces. The infection is probably present on all seed and the severity of the disease may depend on such factors as varietal susceptibility, amount of contamination on the seed, and environmental conditions during the growing season.

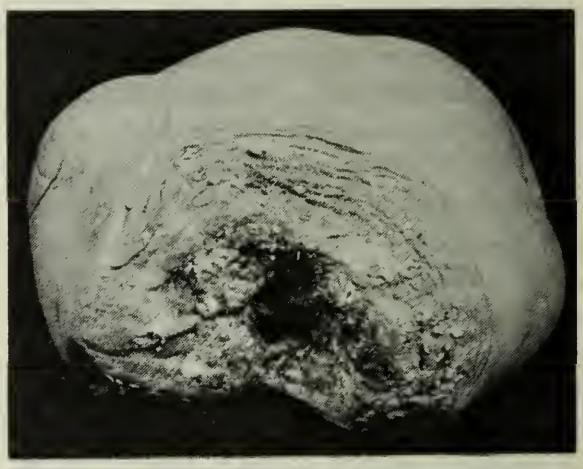
Treatment of seed with streptomycin or organic mercury, or both, before cutting controls the disease somewhat, but does not appear to eliminate the causal organism. Some chemicals may actually injure the tissue and thereby make it easy for the bacteria to enter and penetrate the tubers.

Blackleg seldom occurs when seed is planted whole, with or without being treated.

Sebago, Irish Cobbler, and Fundy are quite susceptible to this disease, whereas Green Mountain, Kennebec, Katahdin, and Netted Gem are resistant enough so that few fields are rejected for blackleg by the Seed Inspection Services.

Fusarium Tuber Rots

The fusarium organisms enter the tubers through wounds contracted during harvesting and grading, but the characteristic dark-brown to black rot does not usually become evident until the potatoes have been stored for several weeks. Infection starts mainly from spores adhering to the seed-piece surfaces at time of planting. In dry, warm weather, the organism develops rapidly in the potato hills, increasing the danger of infection in the harvested crop. Fusarium storage rot never



A tuber infected with fusarium storage rot. The disease is prevalent in potatoes bruised by rough handling.

becomes serious after a cool, moist growing season.

Treating the seed with an organic mercury compound largely controls the disease by getting rid of the spores on the surface of the seed. As the fusarium organism cannot penetrate an uninjured tuber, be extra careful in handling the tubers during and after harvesting.

Sebago, Kennebec, Keswick, and Fundy are very susceptible to the most common type of storage rot found in Eastern Canada. Irish Cobbler, Hunter, and Netted Gem are relatively resistant to this disease organism.

A less common type of fusarium decay, known as "coeruleum rot," not only affects the stored product but also causes the seed pieces to decay. The varieties Keswick, Netted Gem, and Hunter are susceptible to decay by this fungus, whereas Sebago, Kennebec, and Green Mountain are relatively resistant.

Phoma (Pocket) Rot

The phoma, or pocket, rot organism is soil-borne and, like the fusaria, enters the tubers through wounds incurred during harvesting and grading. Pocket rot forms a well-defined black lesion beneath the skin of the tuber and the decay progresses slowly. Sebago and Green Mountain are susceptible to decay by this organism; other common varieties are apparently relatively resistant.

Potato Wart

Potato wart disease is present in Newfoundland. No cases of this disease have been found elsewhere in Canada. A strict quarantine is in force to prevent this serious disease from spreading to noninfested areas.

Virus Diseases

Virus diseases are chiefly identified by growers and inspectors by the symptoms in the foliage and tubers.

When the varieties Green Mountain and Irish Cobbler accounted for a considerable part of the potato production in Eastern Canada, leaf roll and mosaic were regarded as serious diseases because the varieties were highly susceptible. The varieties grown changed markedly between 1930 and 1960 and, in recent years, extensively grown varieties such as Sebago and Katahdin have proved to be quite resistant to both leaf roll and mosaic.

The varieties Irish Cobbler, Hunter, Green Mountain, and Kennebec are susceptible to leaf roll, whereas Irish Cobbler, Green Mountain, Keswick, and Red Pontiac are susceptible to mosaic.

All commercial varieties are susceptible to spindle tuber, a disease characterized by abnormal top growth, elongated tubers, and pointed stem ends. The only effective control for spindle tuber is through maintenance and rogueing of a tuber-unit seed plot. This procedure also aids in the control of mosaic and leaf roll. Spraying with insecticides destroys the insects responsible for the spread of leaf roll and mosaic.

More detailed descriptions of potato diseases and their control are given in Publication 1215.

INSECT PESTS [6]

The most common insects that attack the foliage of potato plants in the Atlantic Provinces are: Colorado potato beetles, flea beetles, tarnished

[6] Information supplied by F. M. Cannon, Research Station, Charlottetown, P.E.I.

plant bugs, and aphids. Those that occasionally attack the stems or underground parts of the plants or tubers are: cutworms, wireworms, white grubs, and flea beetle larvae.

Colorado potato beetles, especially the grubs, may damage the plants extensively by feeding on the leaves, often eating them completely.

Flea beetles damage the plants by eating small holes in the leaves. Although these plants hold their shape, a large part of the tissue is usually damaged, thus reducing the crop yield. The larvae occasionally feed on the growing tubers causing "pimply potatoes."

Tarnished plant bugs are sucking insects that do damage by sucking the juice from the plants, causing the leaves to wither.

Aphids, also sucking insects, damage the plants in the same way as the tarnished plant bugs. But when they feed, they transmit virus diseases, such as leaf roll and mosaic. Four species of aphids may attack potatoes: potato aphids, peach aphids, buckthorn aphids, and foxglove aphids. Usually only one is dominant in a particular locality. In Prince Edward Island, about 95 percent are potato aphids, whereas in parts of New Brunswick the peach aphid predominates. It is important to know the dominant species in your area as different species react differently toward certain insecticides.

Cutworms occasionally cut off young potato plants at the soil surface, but as they do little damage, control measures are seldom necessary.

Wireworms are rarely a problem in potatoes in the Atlantic Provinces, but during the past few years, spasmodic local infestations have been found. Wireworms damage tubers by making deep tunnels in them.

White grubs, the larvae of June beetles, sometimes cause damage by eating holes in potato tubers. They are usually found in fields that have light soil which had been in sod for several years previous to potatoes.

Control

DDT, malathion, and other insecticides are effective in the control of insects attacking potatoes. For recommendations on these insecticides and their uses, refer to provincial crop protection guides or consult specialists in your provincial Department or at the nearest research establishment of the federal Department.

More complete descriptions as well as control measures are given in Publication 1215.

GROWING POTATOES FOR SEED

Seed potato production in Canada began during the early part of the century. The industry is now very important to the economy of Prince Edward Island and New Brunswick and is gaining in importance in Nova Scotia. How important it is to other areas is evident from the large acreage devoted to seed production. Of the 53,000 acres that passed seed inspection in 1965, 83 percent were in the Maritime Provinces.

Certification of seed potatoes in Canada originated in the Maritime Provinces in 1914, and by 1927 it was universal in all parts of the country. The sale of uncertified potatoes for seed, both for the domestic market and for export, was declared illegal in 1930.

Loading Certified seed for export.

Throughout the years, the United States has been the main export market for Canadian Certified seed potatoes, but various quantities are shipped annually to Cuba, Greece, Venezuela, Jamaica, Dominican Republic, Argentina, Trinidad, South Africa, Porto Rico, Uruguay, and other countries.

Most seed potatoes are sold in the 'A' size (3 to 12 ounces) and the 'B' size (1½ to 3 ounces) grades, with a special 'B' size (1½ to 4 ounces) grade meeting the demand of specialized markets.

Effect of Type of Set and Planting Distance on Yields

Type of set and planting distance markedly influence the grades and yields of marketable tubers. It is the aim of seed potato growers to produce high yields of salable tubers in the sizes and grades most likely to meet with a ready market demand. The use of new varieties and better pesticides, together with improved fertility and management practices, while increasing yields, has also tended to increase the production of large tubers of limited market value.

In tests at Charlottetown, 6-inch spacings of whole or halved tuber sets of 1½-ounce weight produced significantly higher yields of standard seed tubers than did 12-inch spacings of 1½-ounce sets cut from random-sized tubers. The number of 'B' size tubers also increased as the ratio of set size to whole-tuber size increased and the distance between sets narrowed. At the same time, the number of tubers above the 'A' size grade decreased. Reactions in Green Mountain, Irish Cobbler, Katahdin, and Sebago were quite similar.

A tuber-unit planter.

Tuber-unit Planting

To produce high-quality Foundation and Certified seed commercially, the tuber-unit method of planting is recommended. Tuber-unit planting means the planting of all seed pieces from one tuber in adjacent spaces, so that all plants from the tuber can be readily identified. This ensures that practically all diseased plants or varietal mixtures are removed. As virus diseases do not always infect tubers uniformly, all seed pieces cut from one tuber may not be infected, or some may be infected more than others. If four sets are cut from an infected tuber and planted at random, two of the plants may show readily detected virus symptoms, while the other two, which will also produce virus-infected tubers, may show only very slight symptoms that even an expert roguer may miss. It is easy to detect the infected plants when all sets are planted adjacent to one another.

Tuber-unit planting may be done by hand, with an assisted-feed planter, or by a special planter that cuts and plants each tuber in units of four. Place the four sets consecutively in the furrow at the desired spacing. A space at least twice the width between sets may be left between individual units. Disinfect the cutting knife after cutting each tuber. Cover the seed pieces in the furrows as soon as possible to protect them from injury by the sun and wind.

REGULATIONS FOR PRODUCING CERTIFIED SEED POTATOES[7]

The growing and sale of seed potatoes in Canada is governed by regulations of the Destructive Insect and Pest Act administered by the Canada

[7] Information supplied by G. C. Ramsay and J. I. G. Ross, Production and Marketing Branch, Charlottetown, P.E.I.

Department of Agriculture. Under these regulations, growers are required to plant Foundation seed to be eligible for certified seed inspection. The inspector requires tags of purchased seed before he inspects the fields. Only varieties that are registered in Canada are eligible for inspection.

If two or more varieties are planted in a field, a space of at least two rows is required between them; if one variety is rejected for a virus disease, a space of 200 feet is required between the infected variety and the part of the other field that will be certified. Fields that are severely damaged by insects or that lack a uniform stand are rejected.

After a crop has passed two field inspections, a bin inspection is carried out to determine if the stock is sufficiently free from tuber diseases and malformations to meet the requirements of the Act. After all requirements have been met, official tags are issued. These tags bear the certificate number of the grower's field, date of issue, variety, class, and size. One tag is attached to each container before sale. At the end of the crop year, each certified grower completes a tag record and forwards it to the Officer in Charge, Seed Potato Inspection Service, for his area. A penalty is provided for the misuse of tags.

If bacterial ring rot is found in a grower's field, his total acreage is rejected for certification. He must then carefully disinfect his buildings and equipment under the supervision of a plant protection inspector. Because ring rot is a serious disease, any suspicious-looking tuber should be sent to the nearest seed potato inspector for examination.

In an endeavor to maintain the high quality of seed potatoes, a potato improvement program has been started in the main seed-producing areas of Canada. This program includes greenhouse testing by eye indexing for the various mosaics, spindle tuber, and leaf roll; laboratory testing for detecting bacterial ring rot; the growing on Elite seed farms of Elite I seed from eye-indexed tubers by the four-hill unit method and Elite II seed from Elite I seed; and the growing of Foundation I seed from Elite II seed by selected growers. All the above classes must be grown in isolated areas. To assist in putting the improvement program into operation, Elite seed farms are now maintained by the provincial departments of agriculture of Prince Edward Island, New Brunswick, and Quebec. Interested seed growers may obtain additional information from their nearest plant protection inspector.

GROWING POTATOES FOR PROCESSING [8]

The potato processing industry in Canada has grown rapidly in the last 10 years; it used 9.5 percent of the 1962-63 crop year production compared with 3.9 percent of the 1955-56 crop year production. The increased sales of frozen French fries and the development of dehydrated potatoes, as crystals and flakes, has accounted for most of this increase. The manufacturers of potato chips and potato starch require large quantities of processing potatoes, while the manufacturers of flour, canned potatoes, patties, puffs, and other products require smaller amounts.

In the United States, 25 percent of the 1963 crop was processed and indications are that this amount will

[8] Information supplied by D. A. Young, Research Station, Fredericton, N.B.

Eye indexing in the greenhouse.

continue to increase. The expected development of the processing industry in Canada will increase the requirements for high-quality processing potatoes.

Growing potatoes for a processor is a specialized job requiring knowledge and care from the time the decision is made to plant processing potatoes until the crop is delivered safely to the plant. If you are considering the production of processing potatoes, you should discuss the matter fully with the processor to whom you plan to sell. Processors often make recommendations to their growers regarding such factors as variety, fertilizer application, and storage temperatures, and in such cases, the recommendations of the processor should be followed.

Dry Matter Content

Dry matter content it particularly important in the processing industry. Dry matter, or total solids, refers to the part of a potato that remains after the water is removed; it is expressed in percent. The dry matter of a potato is made up of starch, sugar, nitrogenous materials, cell wall materials, and minerals. Of these, the starch makes up about two thirds of the total.

Potatoes with a high dry matter content give the highest yield of chips for a given weight of tubers. The higher the dry matter the lower the oil content of chips or French fries. This is of twofold importance since the frying oil used is expensive and the higher the oil content of the end product, the poorer the flavor and, for chips, the shorter the shelf life.

There are a number of ways to determine dry matter. Tubers can be dried in an oven until they reach a constant weight. They can be immersed in brine solutions of known specific gravity and the dry matter

calculated from the number that float or sink in these solutions. Probably the most common method is by the use of a potato hydrometer. This instrument, which consists of a wire basket attached to a graduated cylinder, indicates the average dry matter content of a sample of potatoes placed in the basket and immersed in water until the hydrometer floats (specific gravity is also indicated). If you are interested in the dry matter content of your crop, you should acquire one of them. In using the instrument to check the dry matter content of a particular lot of potatoes, three samples should be tested from different parts of the field or bin and the results averaged.

The term "specific gravity" as applied to potatoes indicates the ratio of the weight of a given volume of potatoes compared to an equal volume of water. Specific gravity is directly related to dry matter content and conversion tables are available to convert from one to the other. The higher the specific gravity, the higher the dry matter content. Under certain conditions, it is simpler to determine specific gravity than dry matter content and this is the reason why the two terms are used to describe the same factor.

Color

Probably the most important problem in the potato chip and French fry industry is the maintenance of a desirable golden brown color throughout the year. This color is the result of the Maillard reaction, a reaction between sugars, amino acids, and other organic components during the frying process. Control of color, which is necessary for a standard product, is difficult because the color after frying is determined by the chemical composition of the potato tuber. Color is affected by date of planting, fertilizer practices, variety, top killing, date of harvest, and storage conditions. Of these, variety and storage conditions are the most important. Satisfactory color can only be obtained when you make an effort to control as many of these factors as possible.

Varieties

To produce chips and French fries of a desirable color and texture, a variety must have a high dry matter content and it should recondition quickly when brought from storage into higher temperatures. Reconditioning is a term used to indicate the disappearance of sugar from the tuber, which takes place at temperatures of 67 to 75° F. Many of the varieties grown for table potatoes do not possess both of these attributes.

Some varieties chip or French fry satisfactorily when first dug in late summer or early fall, but after a short period in storage give only dark-brown chips or French fries. Other varieties that have a high dry matter content do not make good chips under any conditions. An example is Green Mountain, which is well known for its high quality, but is unsatisfactory as a chipper. No particular variety is ideal under all circumstances. Growing conditions vary from one district to another, and a variety that does well in one area may not do as well in another.

At the present time, the following varieties are generally considered satisfactory for processing: for chipping in summer and early fall, Irish Cobbler, Avon, Cherokee, Fundy, and Keswick; for fall, winter, and spring, Avon, Kennebec, Netted Gem, Russet Rural, and Sebago. Although some Katahdins are used for chips, the variety does

not rate high for this purpose, but is considered suitable for French frying. All of these varieties may be satisfactory for French fries although Netted Gem is now the most popular one. The requirements of a variety for French fry color are not quite so exacting as for chips. In commercial production of French fries the strips are usually blanched in hot water before frying; this removes some of the sugar, resulting in a lighter color.

Planting Time

It is best to let the tubers warm up for some time before you cut and plant them. This assists suberization, or healing, when the sets are cut and providing that growing conditions are suitable, the sets will begin to grow as soon as they are planted.

Plant potatoes intended for processing as soon as the ground is in good condition and the season well enough advanced that the sets will not be in cold wet soil for a prolonged period after planting.

The longer the growing season the better, as maturity is highly important in growing potatoes for processing. High dry matter content and good color are associated with mature potatoes.

Fertilizer

The fertilizers used influence the dry matter content of potatoes and the color of chips and French fries made from them.

Excessive applications of nitrogen promote extensive vine growth and prolong the growing season. As a result, the crop is not mature at harvest and is likely to give a dark unsatisfactory color. Potatoes placed in storage when immature are often difficult to recondition after storage at 40° F. Immature potatoes are also harder to store and lose more weight in storage than mature ones. In some cases, excessive applications of nitrogen decrease the dry matter content of potatoes.

Heavy applications of potash consistently reduce the dry matter content of potatoes. This decrease is due largely to the chloride ion in the muriate of potash rather than to the potassium itself. The sulfate form of potash usually results in a higher dry matter content of potatoes than equivalent quantities of the chloride form.

In some areas of the Atlantic Provinces, farmers tend to apply fertilizer at rates in excess of those recommended by the Maritime Fertilizer Council and the provincial departments of agriculture. The recommendations of these groups are based on years of research and are formulated to give maximum yields of high-quality potatoes. Growers producing potatoes for processing should follow these recommendations carefully.

Top Killing

Since the advent of modern insecticides and fungicides, the maturity of potato tops has been delayed. As a result, it is often necessary to use top killers to speed up the natural maturity of a crop so as to ensure that it will be harvested before the onset of cold weather.

If you have to use a top killer, it is best to use one that gives a slow kill. This allows the plant to transfer manufactured food from the leaves to the tubers. When rapid killing methods are used, there is no time for this to take place. Dry matter content is higher in tubers from plants top killed with chemical sprays than by mechanical means such as a roto beater.

Date of Harvesting

Temperatures of 40° F or lower for any length of time can ruin the tubers for chipping. Enough sugar accumulates at these temperatures for the resulting chips to be a dark-brown color and to have a bitter flavor. You must therefore be sure to keep a close check on soil temperatures in the early fall. If they approach 40° F on cool mornings, make every effort to harvest the crop as soon as possible.

Control of Sprouting

A mature potato at harvest has a rest period of several weeks when it does not grow. This period can be extended to six months or more if the tubers are stored at 38 to 40° F. Since most processors, however, prefer never to have their potatoes held at temperatures under 50° F because of the effect on frying color, sprouting must be controlled if processing potatoes are to be held for more than three months. Even though some accessory method of sprout control will have to be used, the first consideration should be to reduce the temperature as quickly and as low as possible without harming the potato for reconditioning and color.

Maleic hydrazide is the most widely used and accepted chemical inhibitor. This material is applied to the foliage as a spray at the time the blossoms fall. Three pounds of active ingredient per acre suppress sprouts satisfactorily for up to a year. The chief drawback is that it must be applied during the growing season before many growers are able to determine their storage program for the coming year.

Tecnazene (TCNB) is a weak sprout inhibitor that is applied as a dust to the potatoes as they are placed in storage or during a regrading operation. Weak sprout inhibition is the main disadvantage of this material.

Chlorpropham (CIPC) is the strongest chemical inhibitor available. It is effective as a gas, as a dust or dip, and as a spray. Chlorpropham inhibits wound healing and can thus predispose the tubers to rot. This detrimental effect can be minimized, in storages with forced-air ventilation systems, by applying chlorpropham as a gas after the tubers have been in storage long enough for the wounds to heal but before sprouting occurs. Chlorpropham, applied at 0.40 g per hundredweight, gives excellent control of sprouting for more than a year at storage temperatures of 50° F. Application can be delayed until after the tubers are in storage and a definite need for an inhibitor is determined. Chlorpropham must be applied under the supervision of a manufacturer's representative. This product is also available as an emulsifiable concentrate to add to the wash water.

Storage and Reconditioning

Potatoes for processing usually require storage conditions quite different from table stock and seed potatoes. Usually, table potatoes are stored at 40° F or slightly lower. At this temperature, there is little or no sprout growth and shrinkage is low. But reducing sugars tend to accumulate in the potatoes and this condition renders the potatoes unsatisfactory for several types of processing. Potatoes stored at 40° F generally require reconditioning for 2 to 6 weeks at 70° F before they make a potato chip or French fry of satisfactory color. Often potatoes stored at 40° F fail to recondition properly.

Generally, potatoes for processing are stored at 50 to 55° F. If the sugar content is low enough for satisfactory processing when the potatoes are placed in storage, it usually remains satisfactory. However, there are exceptions and, in some cases, a period of reconditioning at 70° F is needed.

Potatoes must often be moved to the processor during cold weather. Processing potatoes can be ruined by only a few hours of exposure to temperatures below 50° F. Great care should be taken to maintain temperatures during transit as close as possible to the temperature at which the potatoes were stored.

Contracts made by processors for potatoes generally require that the potatoes will process satisfactorily at the time of delivery. Because of this, the responsibility for proper storage and reconditioning rests with the grower. You must therefore have a proper storage available and know how to operate it before accepting a contract for processing potatoes.

In general, the storage must be well insulated, ventilated so that one cubic foot of air per minute per hundredweight of tubers can be moved uniformly through the potatoes, and heated so that the internal tuber temperature can be raised 1° F a day during the reconditioning period. Information on the design of new storages or the remodelling of existing facilities is available from provincial departments of agriculture.

Internal Sprouting

Internal sprouting is a disorder that has become increasingly important since higher temperatures have been maintained for storing potatoes for processing. When internal sprouting occurs, the eye which grows internally has been pressed firmly against another potato. The growing eye first makes an indentation and eventually pressure becomes so great that it breaks the skin and the sprout grows inward through the tuber. A tuber that has sprouted internally is unsatisfactory for either processing or table use. At storage temperatures of 50 to 55° F, little or no internal sprouting occurs. But at 60 to 65° F, internal sprouting may become severe after four to six months' storage. It is usually more severe in storages where there is little or no air movement than in storages where air movement is adequate or excessive. Sprout inhibitors, when applied correctly, tend to reduce the incidence of internal sprouting. Never store potatoes at 60 to 65° F. When you must recondition them after storage at 40 to 45°, warm them to 70° through the 60 to 65° range as quickly as possible.

CAUTIONS

If you use a pesticide or other chemical, follow closely all the directions and cautions on the label, especially those on the rates of application and on keeping it away from children. Use extra care in disposing of the container and in washing your sprayer.

MORE INFORMATION

For more information, consult your agricultural representative or provincial specialist, or write to the nearest research establishment of the Canada Department of Agriculture or to the Scientific Information Section, Canada Department of Agriculture, Central Experimental Farm, Ottawa.

Some brand names are used in this publication because the chemical names are difficult for general use and there are no official common names for the active ingredients.

Copies of this publication may be obtained from:

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